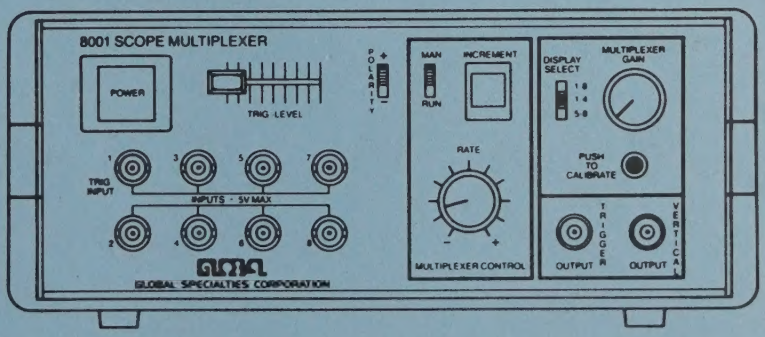
8001
SCOPE MULTIPLEXER



instruction manual

GLOBAL SPECIALTIES CORPORATION

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CONGRATULATIONS!

Welcome to the growing family of Global Specialties Corporation test equipment owners. You have selected a versatile and unique piece of equipment designed for full professional performance. To get the most out of this instrument, please read this manual carefully.

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SPECIFICATIONS

INPUTS:

Number:
Eight via BNC connectors

Bandwidth:
±1 db to 12 MHz, -3 db @ 20 MHz

Impedance:
1 MΩ @ 30 pF for valid input signal 10 KΩ @ 680 pF for input levels exceeding operating voltage range.

Operating Voltage Range:
±5 peak (10Vp-p centered at zero volts)

Absolute maximum voltage:
±50 V peak (100Vp-p)

OUTPUTS:

Vertical Output:
Staircase waveform summed with eight input signals, 0-400 mV full scale. Staircase steps factory calibrated to 50 mV/step. Signal voltage/step variable 0 to ≥ 75 mV @ 5 V input level. Sampling Rate @ 40 KHz to @ 1 MHz.

Impedance: 50 Ohms

Trigger Output:
Amplitude ≥ 2.4 V open circuit. Pulse width 0.1 μsec or 1.0 μsec internally switch selectable.

Impedance: 100 Ohms

Maximum trigger frequency: 10 MHz

POWER: 105-135 VAC @ 15 VA, 57-63 Hz (215-250 VAC, 50-60 Hz optional)

ACCESSORIES INCLUDED: Two PSA-2 BNC to BNC coaxial cables, stock number 11-0027. Flip-up leg, stock number 11-0094.

DIMENSIONS: 4 X 10 X 7 inches (HXWXD) (102 X 254 X 178 mm)

WEIGHT: 3 lbs., 12 ozs. (1.7 Kg)

OPERATING TEMPERATURE: 0-40°C, calibrated @ 25°C ±5%

STOCK NUMBER: 05-8001

CONTROLS

POWER:

Energizes unit, self-illuminated.

TRIG-LEVEL:

Varies trigger threshold from -5 VDC to +5 VDC.

POLARITY:

Selects whether trigger circuit responds to positive or negative slope of input signal.

RATE:

Varies sampling frequency between the limits of 40 KHz and 1 MHz.

MAN/RUN:

Selects multiple or single channel display.

INCREMENT:

In the manual (MAN) mode of operation, each activation of the INCREMENT button causes the next higher numbered channel to be displayed.

DISPLAY SELECT:

Selects the group of channels to be displayed, 1-8, 1-4 or 5-8.

MULTIPLEXER GAIN:

Varies the output amplitude of all displayed channels simultaneously within the range of 0 to ±75 mV for a ±5 V input.

PUSH TO CALIBRATE:

Zeros all displayed traces to allow positioning on the scope.

INTRODUCTION

The Model 8001 Scope Multiplexer extends the versatility of single and dual channel oscilloscopes to 8 channels. It allows the direct comparison of up to eight analog and/or digital time related events simultaneously.

The selected number of channels are scanned sequentially at a rate determined by the front panel RATE control and summed internally with a staircase waveform. The composite signal is buffered and then routed to the VERTICAL OUTPUT BNC on the front panel. The amplitude of the input signal portion is controlled by the MULTIPLEXER GAIN control which effects all selected channels equally.

Display synchronization in accomplished by connecting the scope trigger circuit, with polarity and level controls, to the output of the channel one input amplifier.

The 8001 is a versatile diagnostic tool for use in all phases of analog or digital systems and circuit design, testing and troubleshooting. Microprocessor derived waveforms are easily displayed and analyzed as well as phase-locked loop signals and time related analog based waveforms and events. Observation of multichannel signal processing, e.g. A/D or D/A conversion for physical control application, is an ideal use for the 8001 Multiplexer.

From medical electronic monitoring of multiple waveforms to eight bit microprocessor busses . . . or even intermixed time related analog and digital events, the 8001 expands your display capability while saving you time and effort.

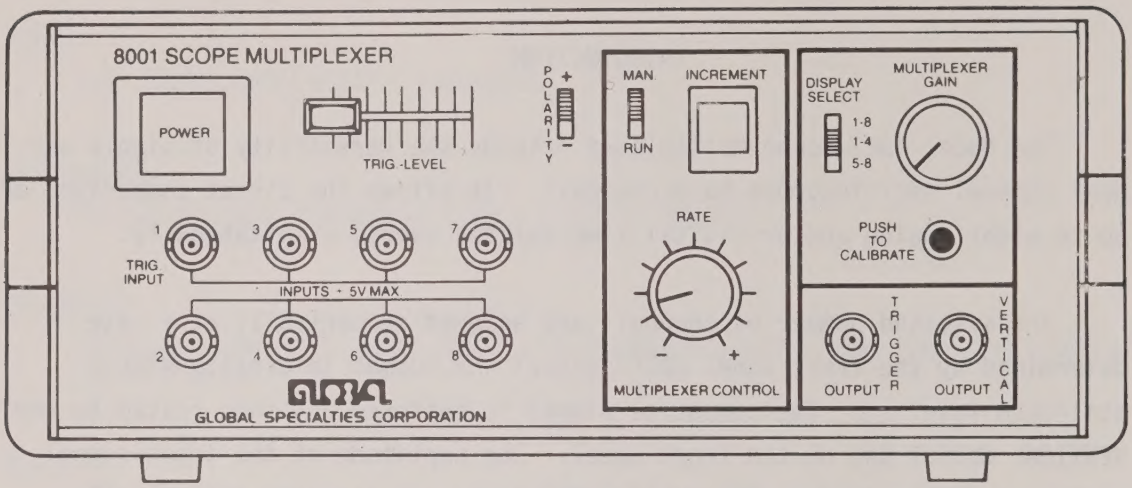


FIGURE 1

INITIAL INSPECTION AND CHECKOUT PROCEDURES

1. Carefully unpack your Model 8001 Scope Multiplexer and inspect for shipping damage. If the instrument received has been damaged in transit, notify the carrier and either your local distributor or the appropriate Global sales office. Retain the shipping carton and packing material for the carrier's inspection.

2. Place the 8001 near the scope to be used. Set scope controls as follows:

   Volts/Division . . . . . 50 mV
   Input Coupling . . . . . DC
   Time/Division . . . . . 5 µsec
   Trigger Mode . . . . . Ext.
   Trigger Slope . . . . . Positive (+)
   Trace Position . . . . . At bottom graticule

3. Connect the multiplexer VERTICAL OUTPUT to the scope vertical input. Connect the TRIGGER output to the scope external trigger input.

4. Turn the 8001 power on by pushing the POWER pushbutton. The button should stay in and the internal indicator lamp should be lit.

5. Set the 8001 controls as follows:

TRIG-LEVEL	Approximately centered
POLARITY	Positive (+)
MAN/RUN	RUN
RATE	Knob indicator at 12 o'clock
MULTIPLEXER GAIN	Knob indicator at 3 o'clock
DISPLAY SELECT	1-8

6. Connect a 100 KHz sine wave with an amplitude of 10Vp-p centered around ground to the channel one input.

7. Adjust the trigger level on the 8001 and, if necessary, on the scope, to get a fixed signal display on the top scope trace and seven lines at 50 mV intervals.

8. Push the PUSH TO CALIBRATE button; see that the channel one display goes to zero and use the scope vertical position control to position the eight lines on the scope graticule.

9. Check that the 8001 TRIG-LEVEL control allows synchronization on the entire positive slope of the signal waveform from the negative peak to the positive peak.

10. Move the multiplexer POLARITY switch to the negative (-) position. Synchronization should now be possible on the entire negative slope of the waveform.

11. Move the MAN/RUN switch to the MAN (manual) position. The display should now consist of any one of the channels. Pushing the INCREMENT button should advance the display to the next higher numbered channel. The display should advance once for each activation of the button.

12. Turn the MULTIPLEXER GAIN control to its full counter clockwise position -- the display should go to zero.

13. Turn the MULTIPLEXER GAIN control to its full clockwise position -- the signal should be approximately 150mVp-p centered on the top graticule.

14. Turn the MULTIPLEXER GAIN CONTROL indicator to three o'clock and move the DISPLAY SELECT switch to the 1-4 position -- only the top four traces should be displayed.

15. Move the DISPLAY SELECT switch to the 5-8 position -- only the bottom four traces should be displayed.

16. Return the DISPLAY SELECT switch to the 1-8 position and connect a signal, which is time related to the signal at input one, to the remaining seven inputs, one at a time. Verify that the signal is of the correct amplitude and is displayed in the correct location, i.e., a signal on channel two should be displayed on the second trace from the top.

17. Switch the scope to INTERNAL TRIGGER. Turn the multiplexer RATE control fully counter-clockwise. Synchronize the scope on the staircase pattern and measure the time interval of one step, which should be 25 ± 5 μsec.

18. Turn the RATE control to its full clockwise position. The step time interval should be 1 ± 0.25 μsec.

19. Turn the RATE control back to mid-range. This completes the initial checkout.

OPERATING INSTRUCTIONS

The Model 8001 Scope Multiplexer has been engineered for simplicity of operation, but a few minutes should be spent familiarizing yourself with the controls and modes of operation as defined in the CONTROLS section of this manual. It is also important to be familiar with the oscilloscope to be used in conjunction with the 8001.

INITIAL CONNECTIONS:

1. Turn power on by pushing the POWER button.

2. Connect the VERTICAL and TRIGGER outputs of the 8001 to the scope vertical and external trigger inputs.

3. Select the number of channels to be observed by placing the DISPLAY SELECT switch in the appropriate position (1-8, 1-4, 5-8).

4. Depress the PUSH TO CALIBRATE button and position the display on the scope as desired, utilizing the scope vertical position control. Since the 8001 is not generating a trigger at this time, the scope must be in an auto trigger mode for steady display.

OPERATION - MULTICHANNEL:

1. Connect input cables to the channels to be used. Note: The 8001 uses the signal present on channel one to generate the scope trigger pulse. All signals to be displayed must be time related to the signal present at input one or an asynchronous display will result. If several multiple frequency, time related signals, e.g., different stages of a counter, are to be displayed, the lowest frequency signal must be connected to channel one.

2. With the scope set to External Trigger, adjust the 8001 TRIG-LEVEL and POLARITY controls, and, if required, the scope Trigger Level control, for a stable display. Use the scope Time/Division control to obtain the desired number of cycles of the input signals and adjust the 8001 RATE control for niminum flicker.

OPERATION - SINGLE CHANNEL:

1. All controls are set and adjustments made the same as for multichannel operation with the exception of the MAN/RUN switch which must be moved to the MAN position. The display will now consist of one of the channels in the group selected by the DISPLAY SELECT switch. Find the desired channel by pushing the INCREMENT button as many times as required. Pushing it three times will advance the display by three channels, etc.

TRIGGER LIMITATIONS:

The trigger circuitry in the 8001 is limited to 10 MHz at which point the trigger output becomes a positive DC level. This is not usually a problem as the lowest displayed frequency must be used for triggering. For operation at frequencies higher than 10 MHz in the multiplex mode of operation, the scope trigger must be connected to the signal source. In single channel operation, the scope can be used in the internal trigger mode.

FUNCTIONAL DESCRIPTION

The Model 8001 Scope Multiplexer is basically an analog multiplexer and a staircase generator whose outputs are combined in a discrete summing amplifier.

The eight inputs are each buffered by high impedance FET buffer amplifiers that drive the multiplexer I.C. The output of the input #1 amplifier also drives the trigger forming circuitry.

A three bit binary counter, driven by the internal, variable rate oscillator in the RUN mode, or the INCREMENT pushbutton in the MAN mode, provides the inputs to the multiplexer decoder as well as the staircase ramp generator.

The output summing amplifier combines the output of the multiplexer I.C. with the output of the staircase generator to produce a composite signal of eight discrete lines with the input signals superimposed on them.

See Figure 2.

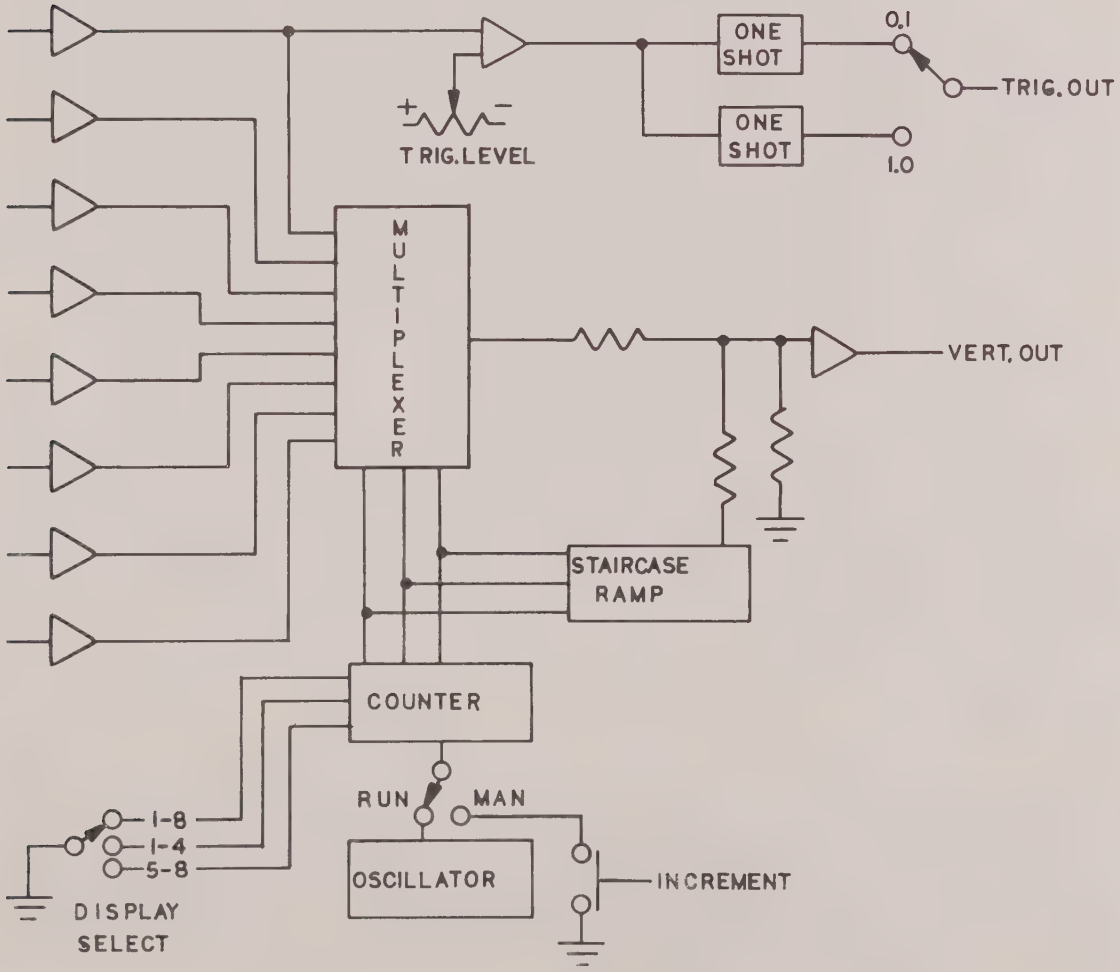


FIGURE 2

CIRCUIT DESCRIPTION
(See schematic)

INPUT AMPLIFIERS

The following description refers to the part numbers of the channel 1 amplifier. Operation of the other seven amplifiers is identical.

The amplifier consists of Q1, a JFET which provides high input impedance and Q9, a PNP transistor which provides current gain and a low output impedance to drive the multiplexer IC.

R1 provides current limiting to the input protection diodes D1 and D9. R9 sets the amplifier input impedance to one MegOhm. R17 adjusts the voltage at the base of Q9 which in turn sets the amplifier output (Q9 collector) to zero volts with zero input voltage. R25 and R49 determine the open loop voltage gain at the output stage of the amplifier. R33 closes the loop in a negative feedback configuration which stabilizes the amplifier. R41 determines the current through the FET and biases it for optimum frequency response.

MULTIPLEXER

The input multiplexing occurs in U1, a CD4051 eight channel multiplexer IC. The CD4051 consists of eight digitally controlled analog switches and a binary three line to eight line decoder which activates the appropriate input signal switch. The eight switches share a common output line which is routed to the output amplifier.

OUTPUT AMPLIFIER

The output amplifier is a dual emitter-follower summing amplifier. The multiplexed signal, whose voltage is divided by R57 and R58, the front panel GAIN potentiometer, is applied to the amplifier via R59. The staircase waveform is coupled to R95. The summed signals are reduced in amplitude by R60. C9 and C10 are compensating capacitors primarily used to cancel out stray system capitance.

The amplifier output is coupled through a 51 Ohm resistor to properly drive a 50 Ohm output cable.

TRIGGER LOGIC

The trigger logic consists of a threshold discriminator, an exclusive or circuit, and a pair of one-shots running simultaneously.

The threshold discriminator, U2, is a high speed comparator. The input to U2 comes from the channel one buffer amplifier output through a voltage divider consisting of R64 and R66, which limits the signal amplitude to U2 to prevent it from being overdriven. R65 and R96 are connected in a positive feedback configuration to provide hysteresis which prevents oscillation when a slowly changing signal crosses the threshold. The threshold level is set by the front panel TRIG-LEVEL pot, R67. Each time the input signal crosses the threshold level, the output of the comparator switches to the opposite state.

The output of the threshold discriminator goes to U3 which is connected as an exclusive or circuit. Each time the input to U3 switches to the polarity selected by the front panel POLARITY switch, the output switches to logical zero.

The dual output one-shots, U4, are triggered each time U3 produces a negative edge. The time constants are selected so that one one-shot has a 100 nsec output while the other has a 1 μsec output. It should be noted that a signal frequency exceeding 10 MHz causes the one-shots to be retriggered into a DC level at a TTL high. The output of either one-shot is selected by slideswitch S5. The 100 nsec pulse will be selected at the factory. The 1 μsec pulse can be selected if the oscilloscope used will not respond to the 100 nsec. The selected output is routed to the front panel TRIGGER OUTPUT jack through R72. Diodes D17 and D18 are provided to prevent damage if power is inadvertently applied to the output BNC.

STAIRCASE GENERATOR

The staircase generator is a D/A converter driven by U9, a pack of FET switches. The control inputs to the three FET switches are connected to the same binary counter which drives the multiplexer I.C. decoder.

The D/A converter is connected to R84, the spacing calibration potentiometer. The output of the potentiometer is buffered by U10, a high frequency amplifier whose output is routed to the main output summing amplifier.

CLOCK AND BINARY COUNTER

The binary counter is a three bit up/down counter which can be incremented by the system clock oscillator or decremented one count at a time by the front panel INCREMENT button. The counter runs in the up mode during clocked operation to keep output excursions to a minimum for maximum frequency response.

In the MAN mode of operation, the counter counts down so that the display advances from lower to higher numbered channels which are displayed with channel one as the top scope trace.

The third bit of the counter is controlled by the front panel DISPLAY SELECT switch. In the 1-8 mode, the counter is allowed to free run. With 1-4 selected, the third bit is held high, and with 5-8 selected, it is held low.

The counter is made up of U6, 1/2 U7, U8 and U11. The remaining half of U7 is a switch debouncer for the manual Increment switch.

In the RUN mode of operation, the clock is generated by U5 which is configured as a free running multivibrator. The clock frequency is determined by C13, R73 and R74, the front panel RATE control, and is adjustable between the limits of 40 KHz and 1 MHz.

POWER SUPPLY

The power supply has a three wire grounded line cord with a one-half amp fuse and self-illuminated switch in the hot side of the power line. The power transformer (T1) is a dual primary unit with a 24V RMS' center tapped secondary. C20 and C21 filter out high frequency line noise.

The transformer secondary drives two full wave rectifiers to develop ±16 VDC unregulated.

The output regulators, A1, A2 and A3 are current limited and go into thermal shutdown if they overheat for any reason. A1 is adjusted to +10.5 VDC, A2 is fixed at +5 ±0.2 VDC and A3 is fixed at -10 ±0.5 VDC. R92, C31 and D23, a 5.1 volt zener diode, constitutes a -5 VDC supply.

APPLICATIONS

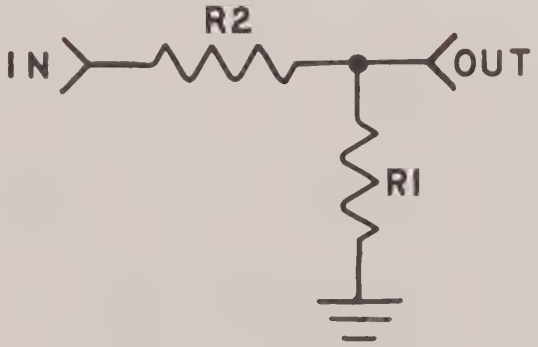
The applications for use of the 8001 eight channel multiplexer are limited only by the imagination of the user. Its ability to display eight separate analog and/or digital signals or levels simultaneously and in real time increases the usefulness and versatility of a scope.

Typical applications include monitoring data lines, parallel outputs of digital counters, timing sequences, analog to digital converters, digital to analog converters, composite television signals, multiple brain scans and microprocessor busses.

INPUT ATTENUATION

As the 8001 inputs are limited to ±5 V peak, there may be occasions when input attenuation is required. The one MegOhm input impedance makes this an easily accomplished task. For signals up to 50 V peak, a ten to one scope probe is ideal.

For more or less than ten to one attenuation, a simple voltage divider is adequate. Example:



$$V_{OUT} = \frac{R1}{R1+R2} \times V_{IN}$$

FIGURE 3

The resistor absolute values are determined by the application. For high frequency signals from a low impedance source, the resistor values should be low. For low frequencies or when sourcing from a high impedance, such as a CMOS or MOS circuit, the resistor values should be relatively high.

For variable attenuation, a simple potentiometer, as shown in Figure 4a, may suffice. If a calibrated attenuation is desired, a step type attenuator, as shown in Figure 4B, is appropriate. In either the potentiometer or step attenuator, the total resistance value is subject to the limitations as mentioned in the previous paragraph.

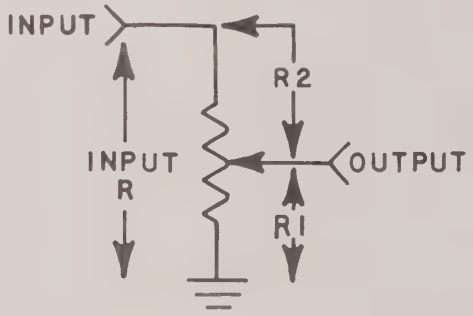


FIGURE 4a

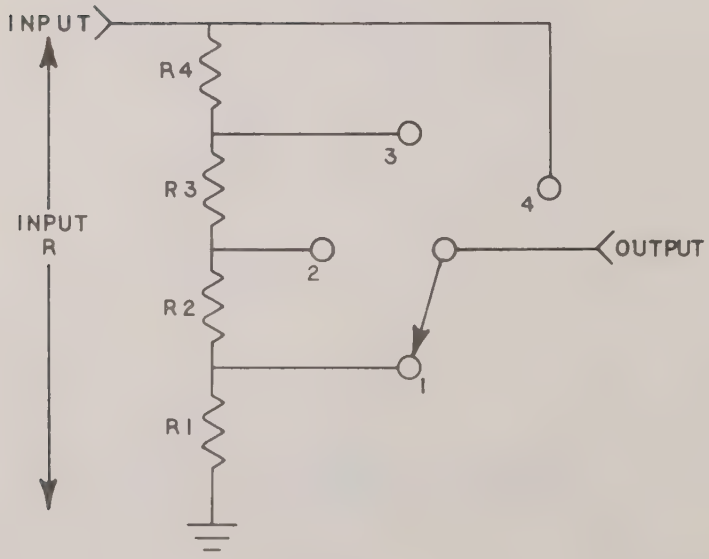


FIGURE 4b

The voltage output when using the potentiometer is again $\frac{R1}{R1+R2} \times V_{in}$

The step attenuator has the advantage of allowing discrete steps, linear or logarithmic. The ratio of the resistor values determines the output scaling.

EXAMPLE 1:

Decade Attenuator

R1 = 100 Ω, R2 = 900 Ω, R3 = 9K, R4 = 90K

Thus input R = 100K

With the switch in position 1: $V_{out} = \frac{100}{100K} \times V_{in}$

$= .001 \times V_{in}$

With the switch in position 2: $V_{out} = \frac{1K}{100K} \times V_{in}$

$= .01 \times V_{in}$

With the switch in position 3: $V_{out} = \frac{10K}{100K} \times V_{in}$

$= 0.1 \times V$

EXAMPLE 2:

R1 = R2 = R3 = R4

$V_{out} = \frac{N}{4} \times V_{in}$

Where N = the switch position

In either of the preceding examples, more resistors can be added for smaller increments of voltage between steps.

FUSE REPLACEMENT (See Figure 6)

Type 3AG 1/2 amp

Location: Inside the case, clip mounted to P.C. board at right rear of case.

WARNING: DISCONNECT LINE CORD FROM AC OUTLET BEFORE REPLACING FUSE!!

PROCEDURE

1. Disconnect all input and output cables from the unit.

2. DISCONNECT LINE CORD FROM AC OUTLET!!

3. Remove bottom half of case following the instructions under "Case Disassembly".

4. Use a nonconducting fuse handling tool to safely remove and replace the fuse. THE REPLACEMENT FUSE MUST BE OF THE SAME TYPE AND RATING.

5. Close the case per the instructions given in "Case Reassembly".

CASE DISASSEMBLY (See Figure 5)

1. Remove all input and output cables.

2. DISCONNECT LINE CORD FROM AC OUTLET!!

3. Turn the 8001 upside down on a soft surface to prevent scratching the top of the case.

4. Remove the rubber foot assembly and Phillips head screw from each of the four corners.

5. Gently slide the bottom half of the case straight upward until it is clear of the unit.

6. The P.C. board can be removed by removing the four threaded standoffs from the corners and the two self-tapping screws near the power transformer.

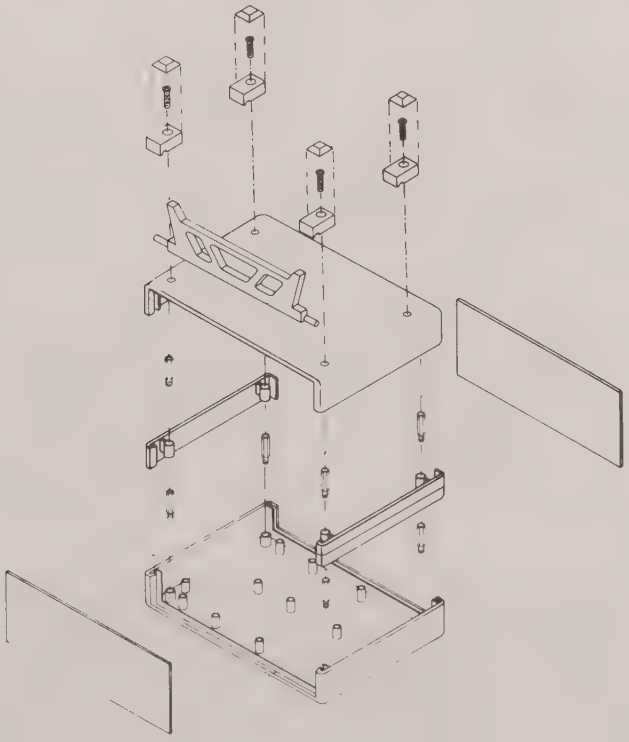


FIGURE 5

CASE REASSEMBLY

1. Ensure that no tools or debris remain inside the case or on the P.C. board.

2. If the P.C. board was removed it should be replaced, component side up, into the top cover. The top cover can be identified by the threaded inserts in the four corner bosses. Be sure that the front panel is installed in the front of the case, identified by the sloping sides. Replace the four threaded standoffs and the two self-tapping screws.

3. Position the bottom of the case so that the front and rear panels enter the appropriate slots. Gently slide the case down until it mates with the top half.

4. Insert the four Phillips head screw, rubber foot assemblies into the four holes. Position them carefully so that they are aligned with the threaded standoffs in the case. Tighten the four screws until they are snug (do not use excessive pressure).

5. Return the 8001 to the upright position.

RECALIBRATION PROCEDURE (Refer to Figure 6)

1. Measure the voltage on the +10.5 volt line and if required, adjust R91 for a reading of +10.5 VDC to +10.6 VDC.

2. Measure the +5 volt line for a reading of +4.8 VDC to +5.2 VDC. There is no adjustment on this regulator so replacement of the regulator is the only solution to an out of tolerance reading. NOTE: Excessive current drain from the regulator can cause the output voltage to read low. This condition can be identified if the body of the regulator feels hot to the touch.

3. Measure the -10 volt line for a reading of -9.5 VDC to -10.5 VDC. This voltage is set by the ratio of R93 and R94 and should not need to be adjusted. See the note in step 2.

4. Measure the -5 volt line for -4.75 VDC to -5.25 VDC.

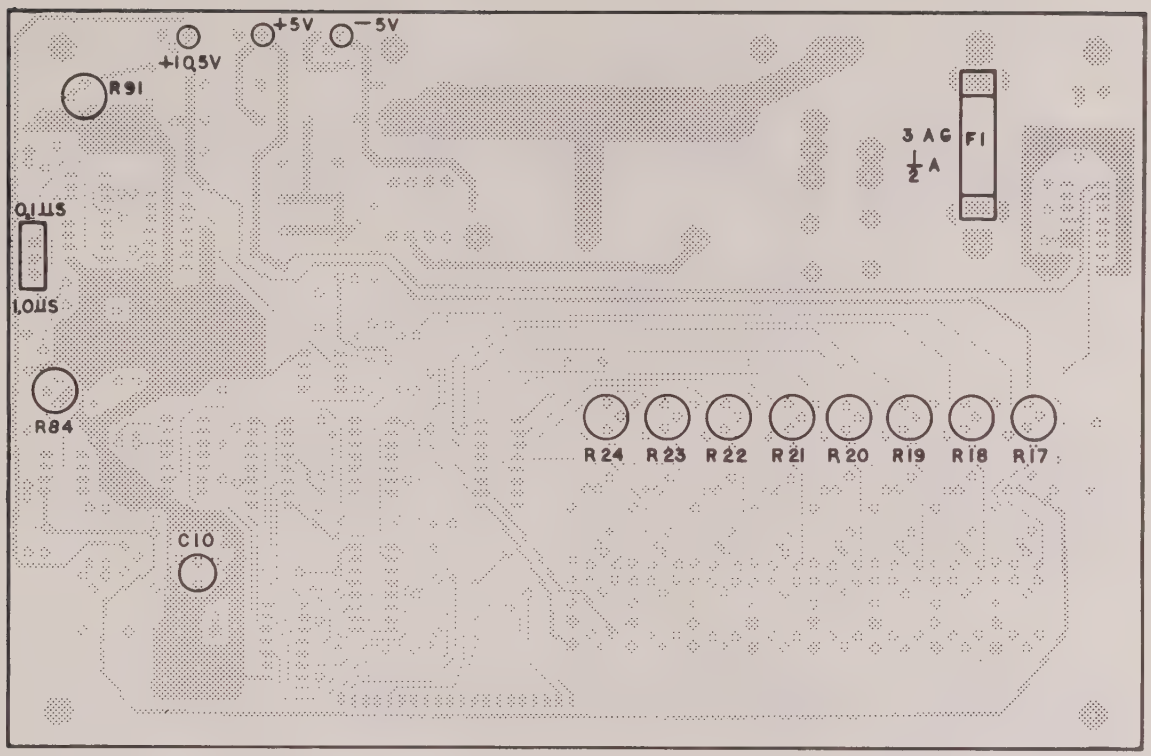


FIGURE 6

5. Remove all input cables and connect the VERTICAL OUTPUT jack to an oscilloscope. Set the scope vertical sensitivity to 50 mV/div. and the display to auto (free running). Adjust R17 (channel one) through R24 (channel eight) to zero to the output of the eight buffer amplifiers. When the amplifiers are properly zeroed, pushing the PUSH TO CALIBRATE button will not cause a change in the display on any of the eight channels.

6. Use the scope vertical position control to position the channel eight trace on the bottom graticule. Adjust R84 to set the spacing between channels to 50 mV or one division on the scope graticule. If the scope has less than eight divisions vertically, it will be necessary to interpolate.

7. Connect a +4 V to a +5 V pulse to one of the inputs. If required, adjust C10 to eliminate any overshoot or rounded corners on the display.
NOTE: This adjustment should be done very carefully. Too much capacitance at C10 will cause the sine wave frequency response of the 8001 to peak; too little capacitance causes a roll-off.

FACTORY SERVICE AND REPAIR

Global Specialties Corporation will service and repair this instrument free of charge for a period of one full year (see Warranty). Please return it, shipping charges prepaid, in its original box with a copy of sales slip or original invoice to:

GLOBAL SPECIALTIES CORPORATION
70 FULTON TERRACE, P.O. BOX 1942
NEW HAVEN, CONNECTICUT 06509
ATTN: SERVICE DEPARTMENT

Your instrument will be repaired, retested and promptly returned to you. If it needs servicing and is out of warranty, follow the above instructions and enclose $50.00 for Factory Service. This amount covers most routine repairs; if damage to your unit is more extensive, we will advise you of additional costs before proceeding.

WARRANTY

Global Specialties Corporation warrants this device to be free from defective material or workmanship for a period of one full year from date of original purchase.

Global Specialties Corporation under this warranty is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within one full year from date of original purchase.

Units returned to Global Specialties Corporation that have been subject to abuse, misuse, damage or accident; have been connected, installed or adjusted contrary to the instructions furnished by Global Specialties Corporation or repaired by unauthorized persons will not be covered by this warranty.

Global Specialties Corporation reserves the right to discontinue models; change specifications, price or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

Global Specialties Corporation shall not be liable in any way for consequential damages resulting from use of this device.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Global Specialties Corporation is authorized to assume any other obligation in connection with the sale and purchase of this device.

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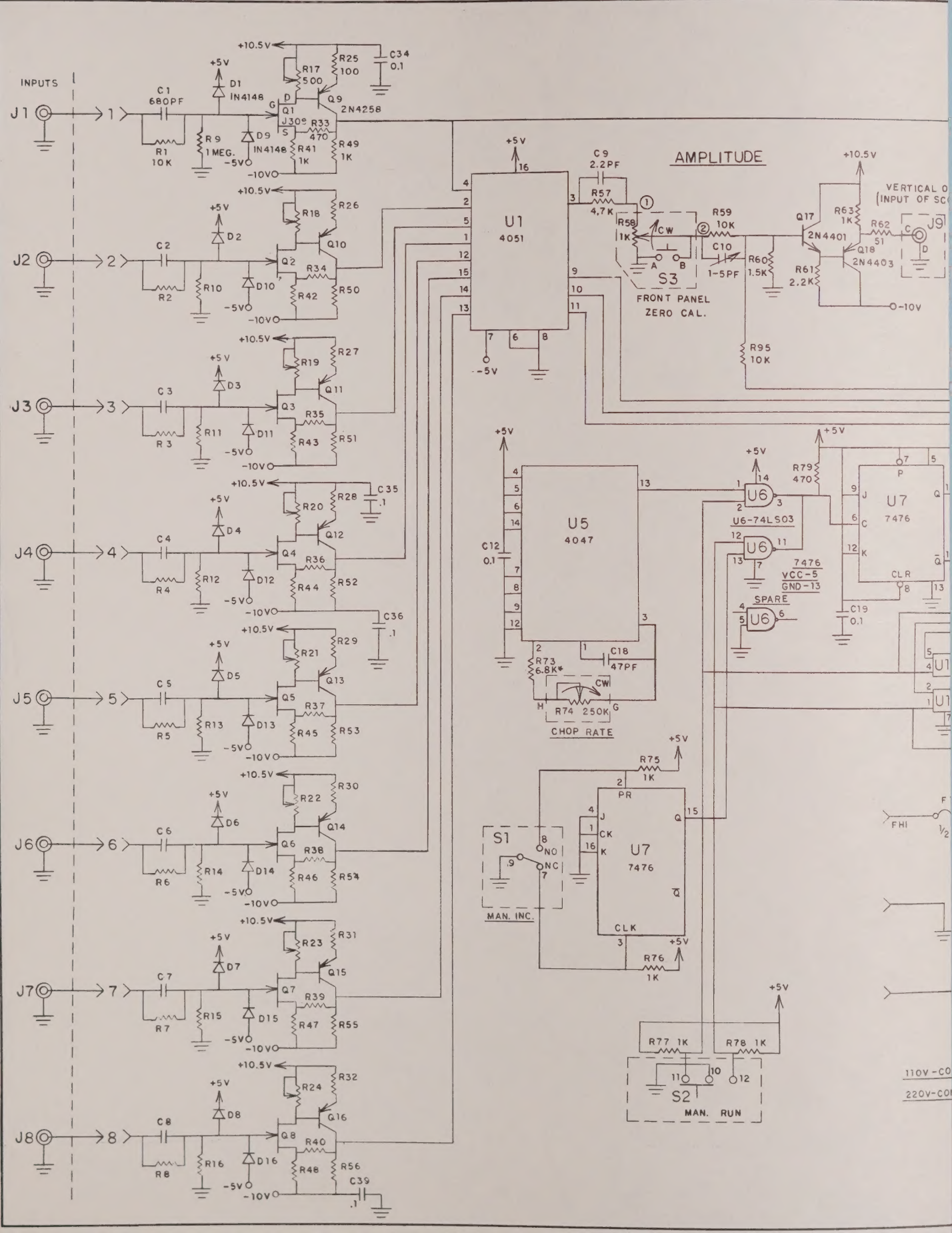
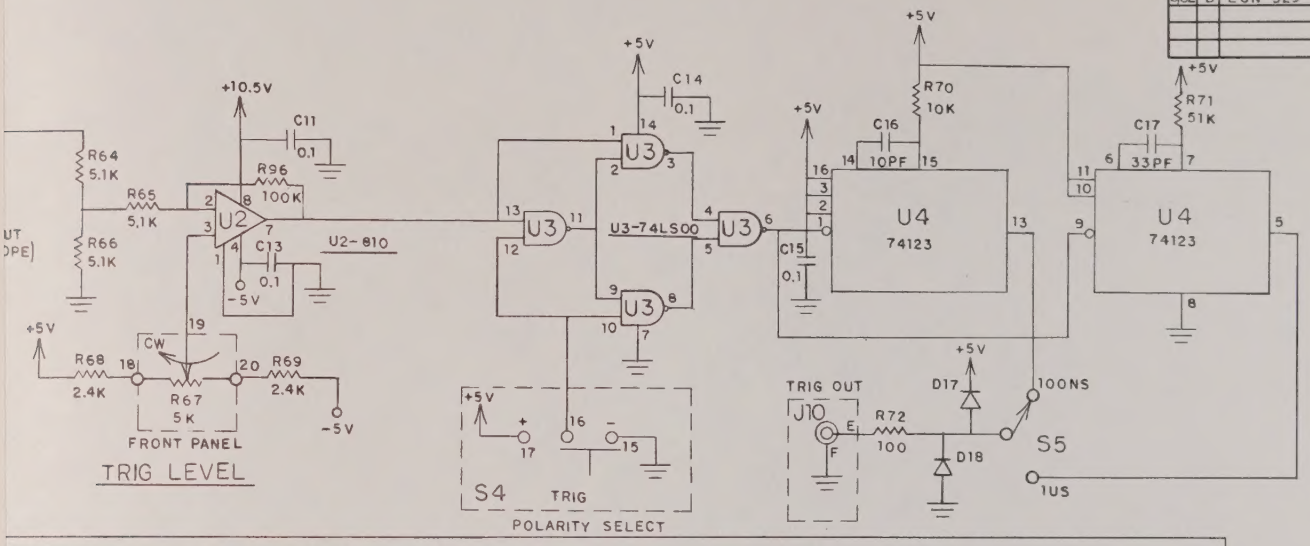
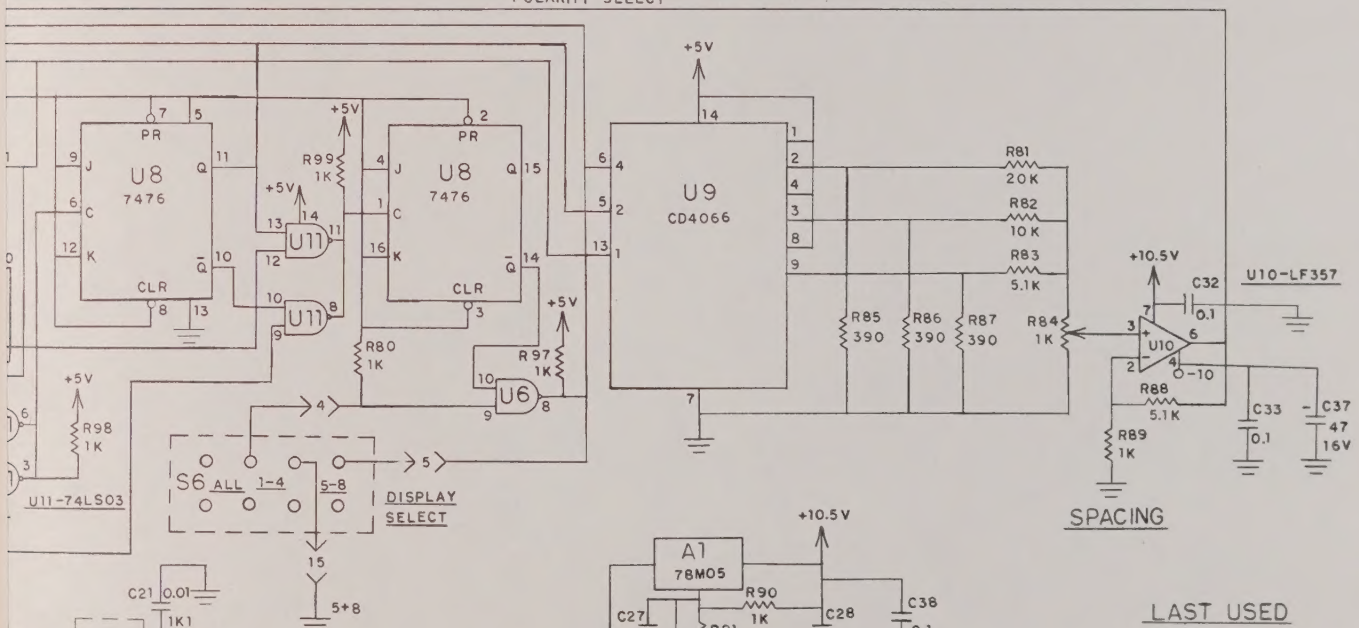
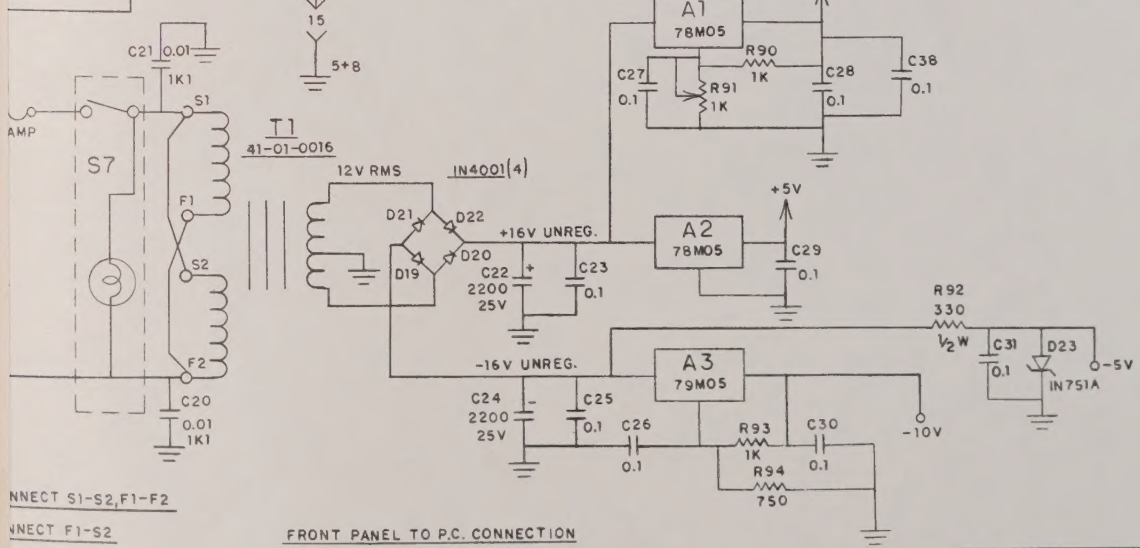

INPUTS
J1
J2
J3
J4
J5
J6
J7
J8
C1 680PF
C2
C3
C4
C5
C6
C7
C8
R1 10K
R2
R3
R4
R5
R6
R7
R8
R9 1 MEG.
R10
R11
R12
R13
R14
R15
R16
D1 IN4148
D2
D3
D4
D5
D6
D7
D8
D9 IN4148
D10
D11
D12
D13
D14
D15
D16
+5V
-5V
-10V
+10.5V
Q1 J309
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9 2N4258
Q10
Q11
Q12
Q13
Q14
Q15
Q16
R17 500
R18
R19
R20
R21
R22
R23
R24
R25 100
R26
R27
R28
R29
R30
R31
R32
R33 470
R34
R35
R36
R37
R38
R39
R40
R41 1K
R42
R43
R44
R45
R46
R47
R48
R49 1K
R50
R51
R52
R53
R54
R55
R56
C34 0.1
C35 .1
C36 .1
C39 .1
U1 4051
C9 2.2PF
R57 4.7K
R58 1K
CW
S3
FRONT PANEL ZERO CAL.
AMPLITUDE
R59 10K
C10 1-5PF
R60 1.5K
R61 2.2K
R95 10K
Q17 2N4401
Q18 2N4403
R63 1K
R62 51
VERTICAL O
INPUT OF SC
J9
U5 4047
C12 0.1
R73 6.8K*
C18 47PF
R74 250K
CHOP RATE
U6-74LS03
SPARE
R79 470
U7 7476
7476
VCC-5
GND-13
C19 0.1
CLR
R75 1K
R76 1K
S1
MAN. INC.
NO
NC
R77 1K
R78 1K
S2
MAN. RUN
110V-CO
220V-CO
FHI

DATE	SYM	REVISION RECORD	AUTH	DR	CK
6/82	A	ECN 518		DM	
8/82	B	ECN 529		DM	







LAST USED

R99
C39
D23
Q18
U11
J10
S7
A3

NNECT S1-S2, F1-F2

NNECT F1-S2

FRONT PANEL TO P.C. CONNECTION
MARKED WITH CIRCLED NUMBER.
• FACTORY ADJUST

ALL UNMARKED DIODES
IN4148

TOLERANCES (EXCEPT AS NOTED)	Global Specialties Corporation P.O. BOX 1646 NEW HAVEN, CONNECTICUT 06506		
DECIMAL ±		SCALE —	DRAWN BY D.R.M.
FRACTIONAL ±	TITLE MULTIPLEXIER SCHEMATIC		
ANGULAR ±	DATE 8-11-82	DRAWING NUMBER 03-05-0035	